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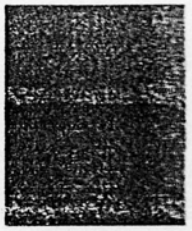

PRELIMINARY GEOTECHNICAL REPORT

FORT LEAVENWORTH HOUSING

PHASE 1D

LEAVENWORTH, KANSAS

PREPARED FOR

GOSSEN LIVINGSTON ASSOCIATES

APRIL/MAY 2002

PROJECT NO: 74-00555-3B-147

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Wichita, KS 67202
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APPENDIX A

FIELD EXPLORATION RESULTS

FORT LEAVENWORTH HOUSING
PHASE 1D
LEAVENWORTH, KANSAS

Allied Project No: 74-00555-3B-147

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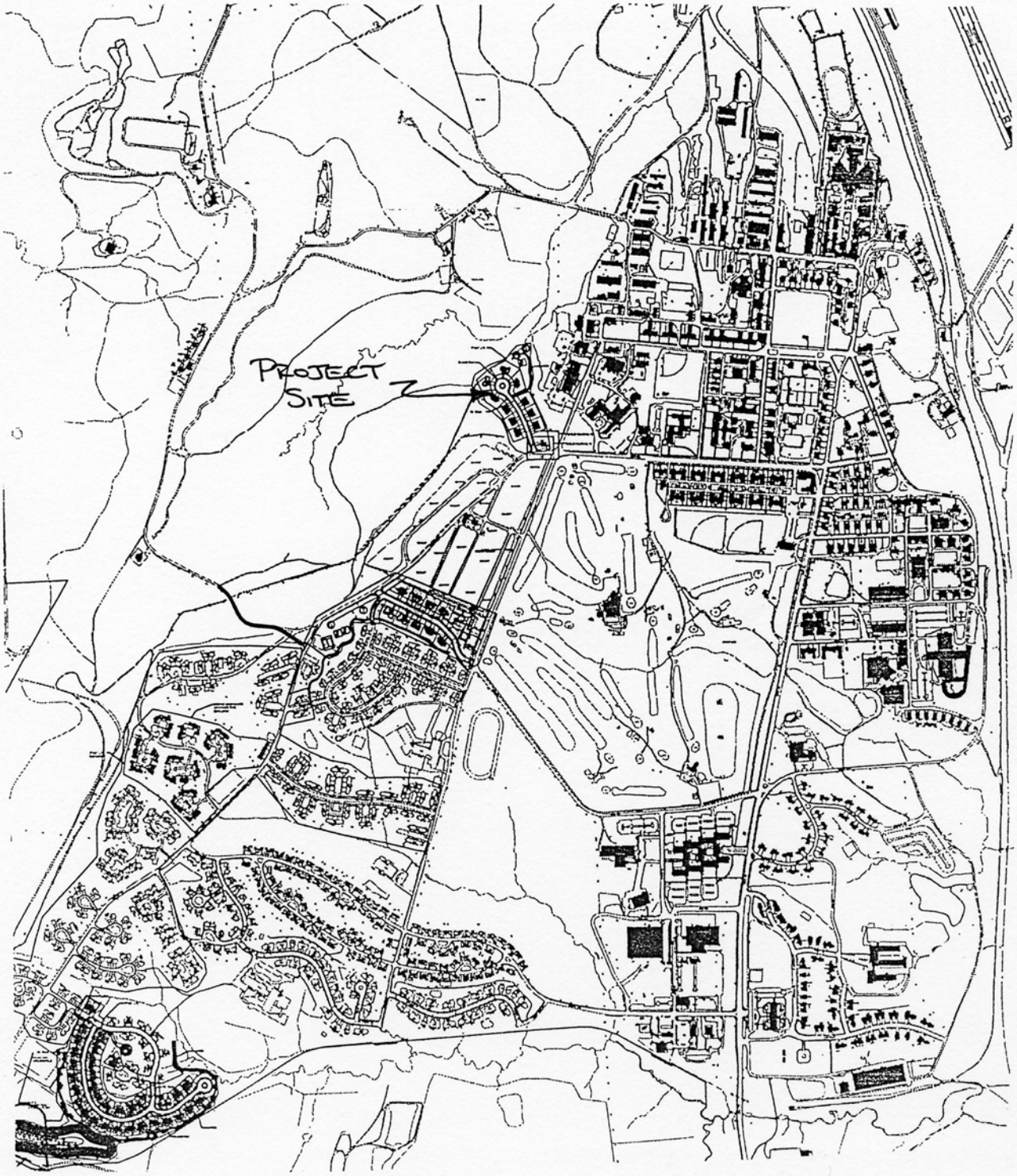
SITE LOCATION MAP

FORT LEAVENWORTH HOUSING - PHASE 1D - LEAVENWORTH, KANSAS

Allied Project No: 72-00555-003B-259



Prepared By: **smh**

No Scale

Figure A-1

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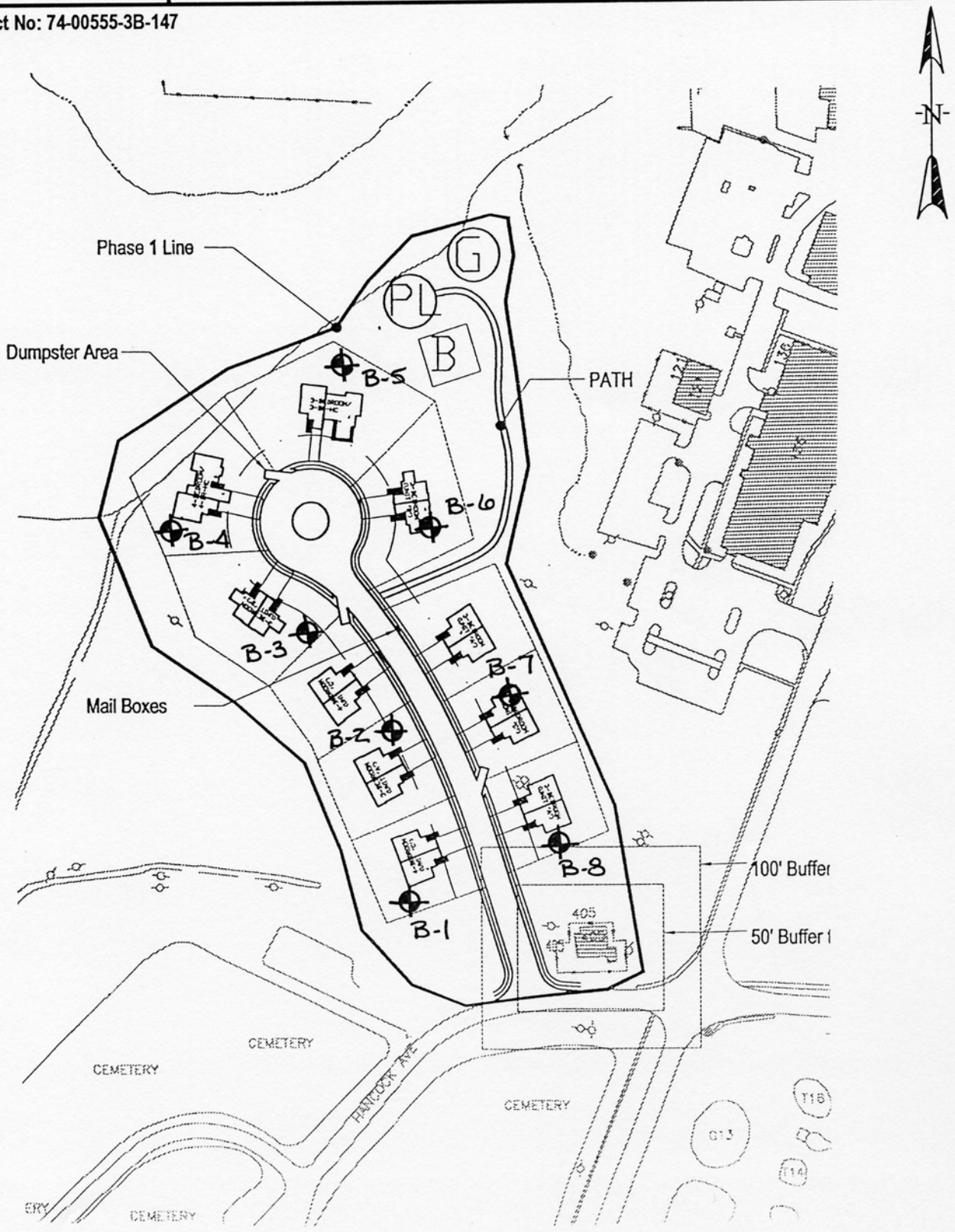
BORING LOCATION SKETCH

FORT LEAVENWORTH HOUSING PHASE 1D - LEAVENWORTH, KANSAS

Allied Project No: 74-00555-3B-147



Prepared By: **smh**

No Scale

Figure A-2

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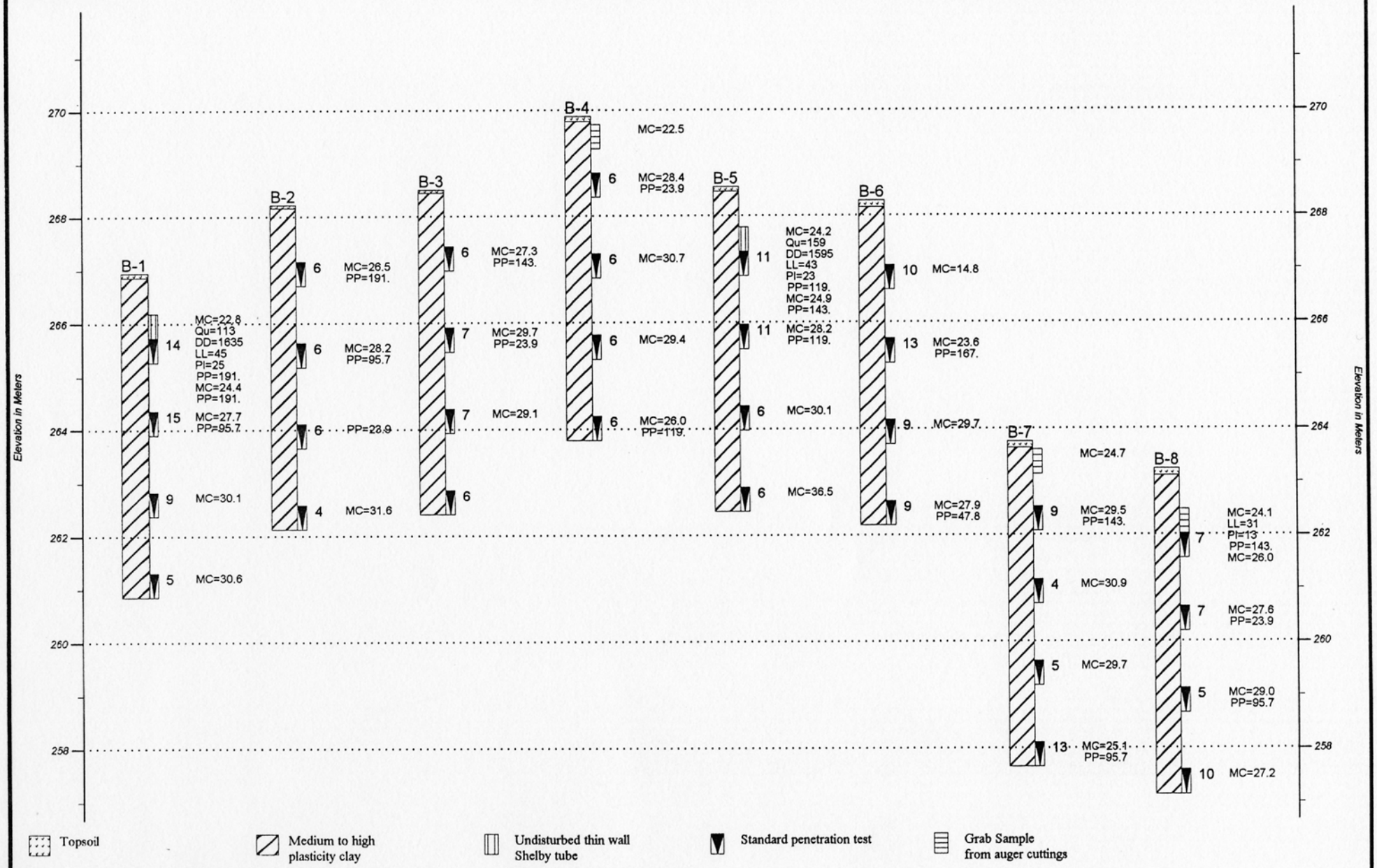
SUMMARY OF EXPLORATORY BORINGS

FORT LEAVENWORTH HOUSING PHASE 1D - LEAVENWORTH, KS.



Note: Profiles present summary of data. They are not proportional and do not present a cross section of the site.

Figure A-3

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EXPLORATORY BORING LOG

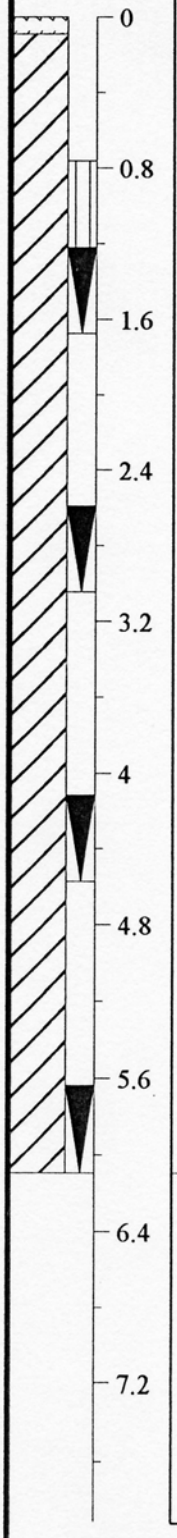
B-1

FORT LEAVENWORTH HOUSING PHASE 1D - LEAVENWORTH, KS.

PROJECT NO: **74-00555-3B-147** | BORING LOCATION: **see boring location sketch**

SCALE: 1 CM= 40 CM | BORING DATE **4-13-02** | DRILLER **KJP** | LOGGED BY **MAH** | CHECKED BY **SMH**

WATER LEVEL @ DRILL **dry** | WATER LEVEL AT 24 HRS | WATER LEVEL AT 72 HRS



ELEVATION	SOIL DESCRIPTION	NO.	TOOL	SPT	SPT GRAPH 10 25 40	% Moist.	Dry Den. (kg/m3)	Qu (kPa)	Pp (kPa)	% Fines	PI
266.95 266.86	*TOPSOIL: clay, dark brown, moist* *CLAY: dark brown to blue, very moist, stiff*										
		1-1	S			22.8	1635.6	113.9	191.5		25
	... dark grey	1-2	P	14		24.4			191.5		
	... blue	1-3	P	15		27.7			95.7		
	... medium stiff	1-4	P	9		30.1					
		1-5	P	5		30.6					
	END OF BORING										

NOTE: This information only pertains to this boring at the time of drilling and may not be indicative of entire site.

Figure A-4

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EXPLORATORY BORING LOG

B-2

FORT LEAVENWORTH HOUSING PHASE 1D - LEAVENWORTH, KS.

PROJECT NO: **74-00555-3B-147** | BORING LOCATION: **see boring location sketch**

SCALE: 1 CM= 40 CM | BORING DATE **4-13-02** | DRILLER **KJP** | LOGGED BY **MAH** | CHECKED BY **SMH**

WATER LEVEL @ DRILL **dry** | WATER LEVEL AT 24 HRS | WATER LEVEL AT 72 HRS

LOG	ELEVATION	SOIL DESCRIPTION	NO.	TOOL	SPT	SPT GRAPH 10 25 40	% Moist.	Dry Den. (kg/m3)	Qu (kPa)	Pp (kPa)	% Fines	PI
0	268.23 268.17	*TOPSOIL: clay, dark brown, very moist* *CLAY: dark brown to brown, very moist, medium stiff*										
0.8		*... grey with reddish brown*	2-1	P	6		26.5			191.5		
1.6												
2.4			2-2	P	6		28.2			95.7		
3.2		*... blue*										
4			2-3	P	6					23.9		
4.8		*... soft*										
5.6			2-4	P	4		31.6					
		END OF BORING										
6.4												
7.2												

NOTE: This information only pertains to this boring at the time of drilling and may not be indicative of entire site.

Figure A-5

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EXPLORATORY BORING LOG

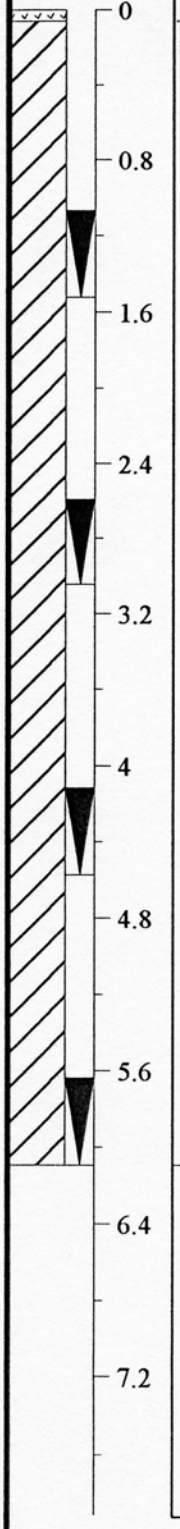
B-3

FORT LEAVENWORTH HOUSING PHASE 1D - LEAVENWORTH, KS.

PROJECT NO: **74-00555-3B-147** | BORING LOCATION: **see boring location sketch**

SCALE: 1 CM= 40 CM | BORING DATE **4-13-02** | DRILLER **KJP** | LOGGED BY **MAH** | CHECKED BY **SMH**

WATER LEVEL @ DRILL **dry** | WATER LEVEL AT 24 HRS | WATER LEVEL AT 72 HRS



ELEVATION	SOIL DESCRIPTION	NO.	TOOL	SPT	SPT GRAPH 10 25 40	% Moist.	Dry Den. (kg/m3)	Qu (kPa)	Pp (kPa)	% Fines	PI
268.51 268.45	*TOPSOIL: clay, dark brown, very moist* *CLAY: dark brown to brown, very moist, medium stiff*										
		3-1	P	6		27.3			143.6		
	... brown with grey	3-2	P	7		29.7			23.9		
	... grey with reddish brown, wet	3-3	P	7		29.1					
		3-4	P	6							
	END OF BORING										

NOTE: This information only pertains to this boring at the time of drilling and may not be indicative of entire site.

Figure A-6

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EXPLORATORY BORING LOG

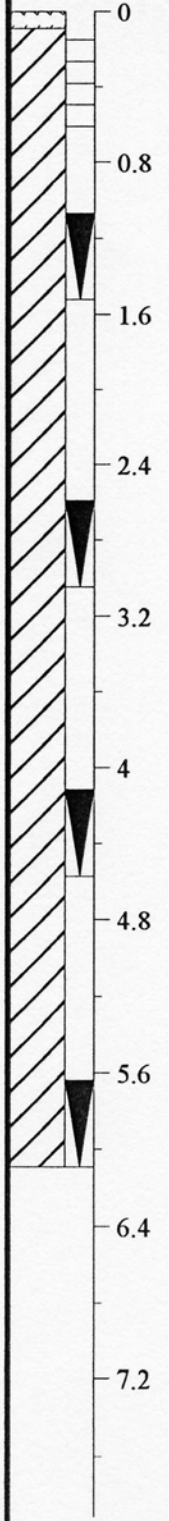
B-4

FORT LEAVENWORTH HOUSING PHASE 1D - LEAVENWORTH, KS.

PROJECT NO: **74-00555-3B-147** | BORING LOCATION: **see boring location sketch**

SCALE: 1 CM= 40 CM | BORING DATE **4-13-02** | DRILLER **KJP** | LOGGED BY **MAH** | CHECKED BY **SMH**

WATER LEVEL @ DRILL **dry** | WATER LEVEL AT 24 HRS | WATER LEVEL AT 72 HRS



ELEVATION	SOIL DESCRIPTION	NO.	TOOL	SPT	SPT GRAPH 10 25 40	% Moist.	Dry Den. (kg/m3)	Qu (kPa)	Pp (kPa)	% Fines	PI
269.89 269.80	*TOPSOIL: clay, dark brown, very moist* *CLAY: dark brown to brown, very moist, medium stiff*	4-1	G			22.5					
		4-2	P	6		28.4			23.9		
		4-3	P	6		30.7					
		4-4	P	6		29.4					
		4-5	P	6		26.0			119.7		
	END OF BORING										

NOTE: This information only pertains to this boring at the time of drilling and may not be indicative of entire site.

Figure A-7

Allied Laboratories
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Wichita, Kansas 67202

EXPLORATORY BORING LOG

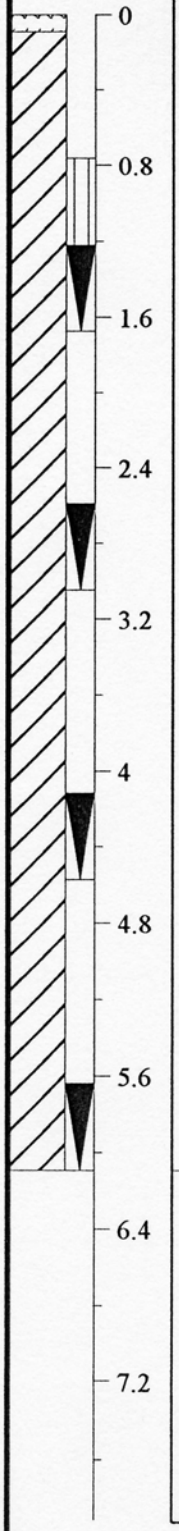
B-5

FORT LEAVENWORTH HOUSING PHASE 1D - LEAVENWORTH, KS.

PROJECT NO: **74-00555-3B-147** | BORING LOCATION: **see boring location sketch**

SCALE: 1 CM= 40 CM | BORING DATE **4-13-02** | DRILLER **KJP** | LOGGED BY **MAH** | CHECKED BY **SMH**

WATER LEVEL @ DRILL **dry** | WATER LEVEL AT 24 HRS | WATER LEVEL AT 72 HRS



ELEVATION	SOIL DESCRIPTION	NO.	TOOL	SPT	SPT GRAPH 10 25 40	% Moist.	Dry Den. (kg/m3)	Qu (kPa)	Pp (kPa)	% Fines	PI
268.55 268.46	*TOPSOIL: clay, dark brown, very moist* *CLAY: dark brown to brown, very moist, medium stiff*										
		5-1	S			24.2	1595.6	159.9	119.7		23
	... stiff	5-2	P	11		24.9			143.6		
		5-3	P	11		28.2			119.7		
	... brown with grey, medium stiff	5-4	P	6		30.1					
		5-5	P	6		36.5					
	END OF BORING										

NOTE: This information only pertains to this boring at the time of drilling and may not be indicative of entire site.

Figure A-8

Allied Laboratories 350 South Washington Wichita, Kansas 67202	**EXPLORATORY BORING LOG**	**B-6**
	FORT LEAVENWORTH HOUSING PHASE 1D - LEAVENWORTH, KS.	

PROJECT NO: **74-00555-3B-147**	BORING LOCATION: **see boring location sketch**			
SCALE: 1 CM= 40 CM	BORING DATE **4-12-02**	DRILLER **KJP**	LOGGED BY **MAH**	CHECKED BY **SMH**
WATER LEVEL @ DRILL **dry**	WATER LEVEL AT 24 HRS **dry**		WATER LEVEL AT 72 HRS	

LOG	ELEVATION	SOIL DESCRIPTION	NO.	TOOL	SPT	SPT GRAPH 10 25 40	% Moist.	Dry Den. (kg/m3)	Qu (kPa)	Pp (kPa)	% Fines	PI
0	268.28 268.16	*TOPSOIL: clay, dark brown, very moist* *CLAY: dark brown to brown, very moist, medium stiff, trace sand*										
0.8			6-1	P	10		14.8					
1.6												
2.4		*... brown, stiff*	6-2	P	13		23.6			167.5		
3.2												
4		*... medium stiff*	6-3	P	9		29.7					
4.8												
5.6			6-4	P	9		27.9			47.9		
		END OF BORING										
6.4												
7.2												

NOTE: This information only pertains to this boring at the time of drilling and may not be indicative of entire site.

Figure A-9

Allied Laboratories
350 South Washington
Wichita, Kansas 67202

EXPLORATORY BORING LOG

B-7

FORT LEAVENWORTH HOUSING PHASE 1D - LEAVENWORTH, KS.

PROJECT NO: **74-00555-3B-147** | BORING LOCATION: **see boring location sketch**

SCALE: 1 CM= 40 CM | BORING DATE **4-12-02** | DRILLER **KJP** | LOGGED BY **MAH** | CHECKED BY **SMH**

WATER LEVEL @ DRILL **dry** | WATER LEVEL AT 24 HRS **dry** | WATER LEVEL AT 72 HRS

LOG	ELEVATION	SOIL DESCRIPTION	NO.	TOOL	SPT	SPT GRAPH 10 25 40	% Moist.	Dry Den. (kg/m3)	Qu (kPa)	Pp (kPa)	% Fines	PI
0	263.76 263.64	*TOPSOIL: clay, dark brown, very moist* *CLAY: dark brown to brown, very moist, medium stiff*	7-1	G			24.7					
0.8			7-2	P	9		29.5			143.6		
1.6		*... grey with reddish brown*										
2.4		*... wet, soft*	7-3	P	4		30.9					
3.2												
4			7-4	P	5		29.7					
4.8		*... very moist, medium stiff*										
5.6			7-5	P	13		25.1			95.7		
		END OF BORING										
6.4												
7.2												

NOTE: This information only pertains to this boring at the time of drilling and may not be indicative of entire site.

Figure A-10

Allied Laboratories
350 South Washington
Wichita, Kansas 67202

EXPLORATORY BORING LOG

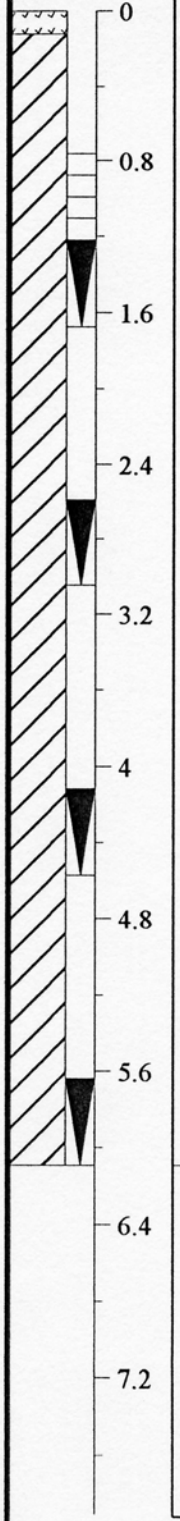
B-8

FORT LEAVENWORTH HOUSING PHASE 1D - LEAVENWORTH, KS.

PROJECT NO: **74-00555-3B-147** | BORING LOCATION: **see boring location sketch**

SCALE: 1 CM= 40 CM | BORING DATE **4-12-02** | DRILLER **KJP** | LOGGED BY **MAH** | CHECKED BY **SMH**

WATER LEVEL @ DRILL **dry** | WATER LEVEL AT 24 HRS **dry** | WATER LEVEL AT 72 HRS



ELEVATION	SOIL DESCRIPTION	NO.	TOOL	SPT	% Moist.	Dry Den. (kg/m3)	Qu (kPa)	Pp (kPa)	% Fines	PI
263.24 263.12	*TOPSOIL: clay, dark brown, very moist* *CLAY: dark brown to brown, very moist, soft to medium stiff*									
		8-1	G		24.1			143.6		13
	... medium stiff, brown	8-2	P	7	26.0					
	... grey with reddish brown	8-3	P	7	27.6			23.9		
	... wet	8-4	P	5	29.0			95.7		
	... very moist, medium stiff	8-5	P	10	27.2					
	END OF BORING									

SPT GRAPH: 10 25 40

NOTE: This information only pertains to this boring at the time of drilling and may not be indicative of entire site.

Figure A-11

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EXPLORATORY BORING LEGEND

FORT LEAVENWORTH HOUSING PHASE 1D - LEAVENWORTH, KS.

Strata symbols

Topsoil

Medium to high plasticity clay

Soil Samplers

Undisturbed thin wall Shelby tube

Standard penetration test

Grab Sample from auger cuttings

Notes:

Exploratory borings were drilled on the dates indicated on the boring logs using a rotary drill rig and either continuous flight auger and/or hollow stem auger.

Groundwater encountered during drilling is presented on the boring logs. The water levels presented are for the times indicated. The water level should be considered as approximate. Water levels may fluctuate several feet due to various factors beyond the scope of this study.

Boring locations were determined by referencing existing site features as indicated on the boring location sketch or boring logs. These locations are approximate.

Ground surface elevations at the boring locations were determined by the drilling crew and should be considered as approximate.

The subsurface soils presented on the boring logs should be considered as approximate. The exploratory boring logs represent average subsurface conditions based on visual observation of auger cuttings during drilling and periodic sampling. Other soil types and thin soil layers may be present which could not be identified with this type of investigation.

The boring logs present sharp transitions between the various soil types. However, these transitions will generally be more gradual in the field. Also, the depths to the soil transitions are based on visual observation and should be considered as approximate.

The data presented on the boring logs is subject to the conclusions recommendations, and limitations discussed in the Geotechnical Report. Additional information on the subsurface soils, groundwater and other conditions may be included in the report which is not presented on the boring logs.

Figure A-12

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GENERAL GEOTECHNICAL NOTES

SOIL CLASSIFICATION TERMINOLOGY

Soil classification is based on ASTM D-2487 "Soil Classification for Engineering Purposes" which is based on the Unified Soil Classification System. Fine grained soils have less than 50 percent of their particles retained on the No. 200 sieve. These soils are classified as silts if they are non-plastic to slightly plastic and as clays if they classify as plastic. Coarse grained soils have more than 50 percent of their particles retained on the No. 200 sieve and are classified as sands, gravels, cobbles and boulders depending on the grain size. Minor and major constituents may be added as modifiers depending on the proportions of the soil types. Additionally, fine grained soils are described based on their consistency and coarse grained soils are delineated by their relative density. Examples: Fat clay with sand (CH) and Silty sand (SM).

WATER LEVEL MEASUREMENTS

Water level measurements presented on the test boring logs are for the times indicated. These measurements may not necessarily represent the actual groundwater levels at the site. Fine grained soils of low permeability may require measurements for extended periods to accurately reflect free water levels. Coarse grained soils will generally reflect true groundwater levels after short periods. Groundwater levels and seepage water can vary depending on time of year, climatic conditions and other factors beyond the scope of normal geotechnical explorations. Typical water level abbreviations follows:

WD - Water level during drilling
WA - Water level after drilling
W24 - Water level 24 hours after drilling
W48 - Water level 48 hours after drilling
CW - Depth to wet cave of boring
CD - Depth to dry cave of boring

SAMPLING AND DRILLING ABBREVIATIONS

Drilling and sampling procedures are typically performed in accordance with ASTM standards unless otherwise noted. Typical sampling and drilling abbreviations follows:

P - Standard Penetration sampler (1-3/8 in. ID split-spoon)
S - 3 in. diameter thin walled Shelby Tube
D - Denison Barrel Sampler
B - Bulk/grab sample
SB - Sawtooth bit barrel sampler
CF4 - 4 in. diameter continuous flight auger
CF6 - 6 in. diameter continuous flight auger
HS - 7-1/4 in. diameter hollow stem auger
NX - Diamond bit coring

DENSITY OF COARSE GRAINED SOILS

Relative Density (D_R)	Percent D_R	Approximate N - Value (blows/foot)
Very Loose	less than 15	0 to 4
Loose	15 to 35	4 to 10
Medium Dense	35 to 65	10 to 30
Dense	65 to 85	30 to 50
Very Dense	85 to 100	over 50

CONSISTENCY OF FINE GRAINED SOILS

Consistency	Unconfined Compressive Strength (Q_U) psf	Approximate N - Value (blows/foot)
Very Soft	Less than 500	0 to 2
Soft	500 to 1000	2 to 4
Medium Stiff	1000 to 2000	4 to 8
Stiff	2000 to 4000	8 to 16
Very Stiff	4000 to 8000	16 to 30
Hard	Over 8000	Over 30

BEDROCK HARDNESS DESCRIPTIONS

Hardness	Approximate N - Value (blows/foot)
Weathered (Soft)	Less than 20
Firm	20 to 30
Medium Hard	30 to 50
Hard	50 to 80
Very Hard	Over 80

PROPORTIONING OF CONSTITUENTS

Constituent Description	Percent
Trace	Less than 5
With	5 to 12
Modifier	More than 12

GRAIN SIZE DESCRIPTIONS

Constituent Description	Particle Size
Silt or Clay	Passing No. 200 Sieve (0.075 mm)
Sand	No. 200 to No. 4 Sieve (0.075 to 4.75 mm)
Gravel	No. 4 to 3 inch Sieve (4.75 to 75 mm)
Cobbles	3 to 12 inch Sieve (75 to 300 mm)
Boulders	Over 12 inch Sieve (300 mm)

Figure A-13

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APPENDIX B

LABORATORY TEST RESULTS

FORT LEAVENWORTH HOUSING
PHASE 1D
LEAVENWORTH, KANSAS

Allied Project No: 74-00555-3B-147

Allied Laboratories
350 South Washington
Wichita, Kansas 67202

LABORATORY TEST SUMMARY

FORT LEAVENWORTH HOUSING PHASE 1D - LEAVENWORTH, KS.

74-00555-3B-147

BORING	SAMP. NO.	Depth (meters)	SPT	MOIST %	DRY DEN (kg/m3)	Qu (kPa)	P.Pen (kPa)	LL	PI	% Gravel	% Sand	% Fines
B-1												
	1-1	0.8		22.8	1635.6	113.9	191.5	45	25			
	1-2	1.2	14	24.4			191.5					
	1-3	2.6	15	27.7			95.7					
	1-4	4.1	9	30.1								
	1-5	5.6	5	30.6								
B-2												
	2-1	1.1	6	26.5			191.5					
	2-2	2.6	6	28.2			95.7					
	2-3	4.1	6				23.9					
	2-4	5.6	4	31.6								
B-3												
	3-1	1.1	6	27.3			143.6					
	3-2	2.6	7	29.7			23.9					
	3-3	4.1	7	29.1								
	3-4	5.6	6									
B-4												
	4-1	0.2		22.5								
	4-2	1.1	6	28.4			23.9					
	4-3	2.6	6	30.7								
	4-4	4.1	6	29.4								
	4-5	5.6	6	26.0			119.7					
B-5												
	5-1	0.8		24.2	1595.6	159.9	119.7	43	23			
	5-2	1.2	11	24.9			143.6					
	5-3	2.6	11	28.2			119.7					
	5-4	4.1	6	30.1								
	5-5	5.6	6	36.5								
B-6												
	6-1	1.2	10	14.8								
	6-2	2.6	13	23.6			167.5					
	6-3	4.1	9	29.7								
	6-4	5.6	9	27.9			47.9					
B-7												
	7-1	0.2		24.7								
	7-2	1.2	9	29.5			143.6					
	7-3	2.6	4	30.9								
	7-4	4.1	5	29.7								
	7-5	5.6	13	25.1			95.7					
B-8												
	8-1	0.8		24.1			143.6	31	13			
	8-2	1.2	7	26.0								
	8-3	2.6	7	27.6			23.9					
	8-4	4.1	5	29.0			95.7					
	8-5	5.6	10	27.2								

Figure B-1

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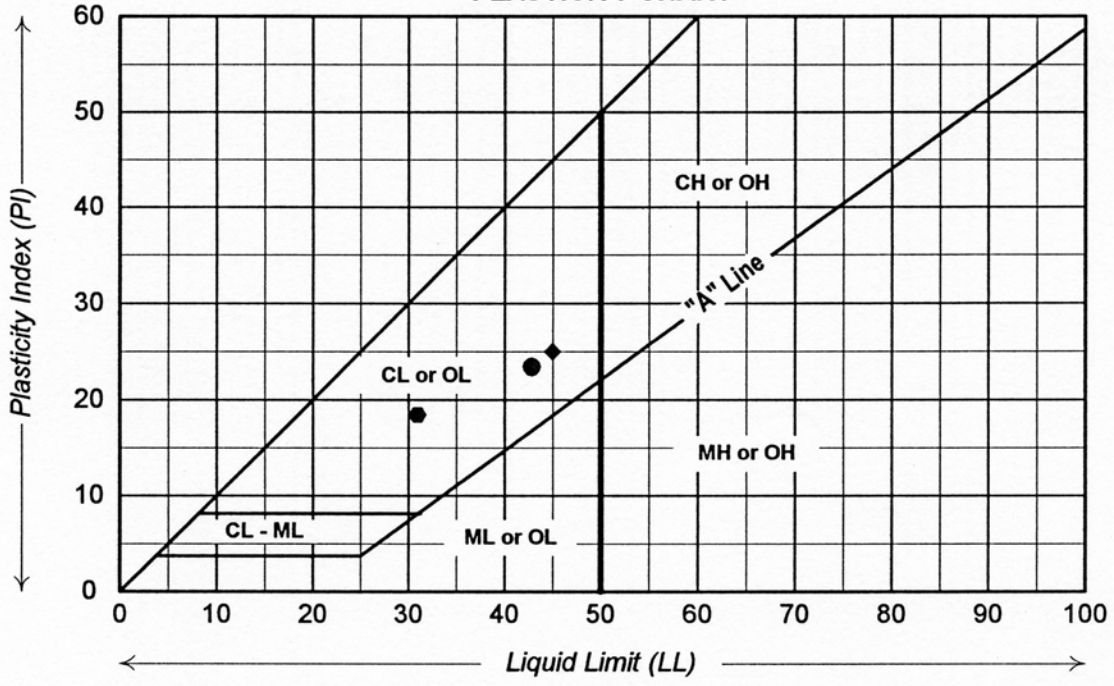
LIQUID AND PLASTIC LIMITS TEST REPORT

ASTM D-4318

PROJECT NO: 74-00555-3B-147

FORT LEAVENWORTH HOUSING PHASE 1D - LEAVENWORTH, KS.

PLASTICITY CHART



TEST RESULTS

SYMBOL	SAMPLE NUMBER	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	PERCENT FINES	ASTM D - 2487 CLASSIFICATION	
◆	1-1	45	20	25	not tested	LEAN CLAY	CL
●	5-1	43	20	23	not tested	LEAN CLAY	CL
⬢	8-1	31	18	13	not tested	LEAN CLAY	CL
▲							
■							
○							
✕							
+							
◇							
□							

Figure B-2

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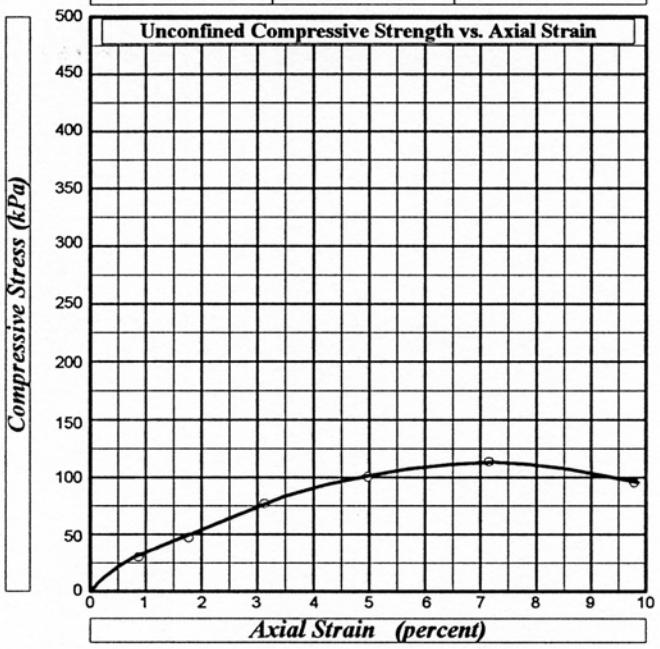
UNCONFINED COMPRESSION TEST RESULTS

ASTM D-2166

Project No. 74-00555-3B-147

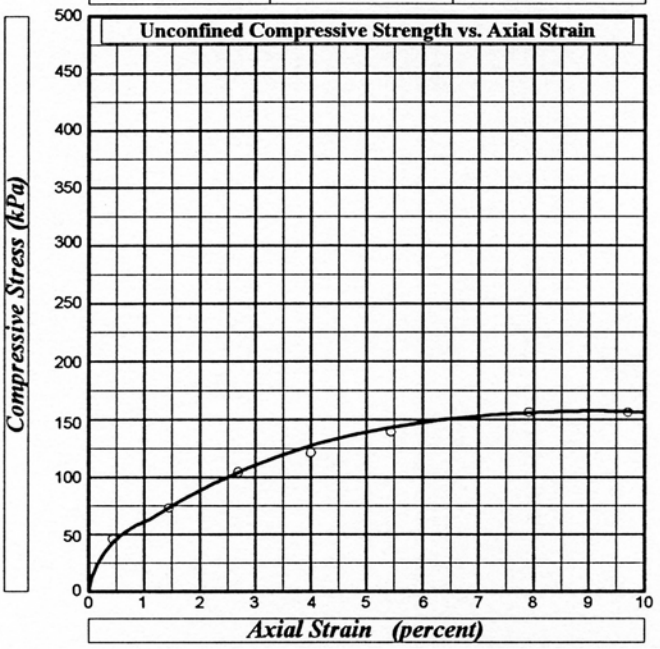
Project Name: **Fort Leavenworth Housing Phase 1B - Leavenworth, Kansas**

Boring: B-1	Sample: 1-1	Depth: 0.8 m
Moisture: 22.8	Density: 1636 kg/m3	Length/Dia. 1.96



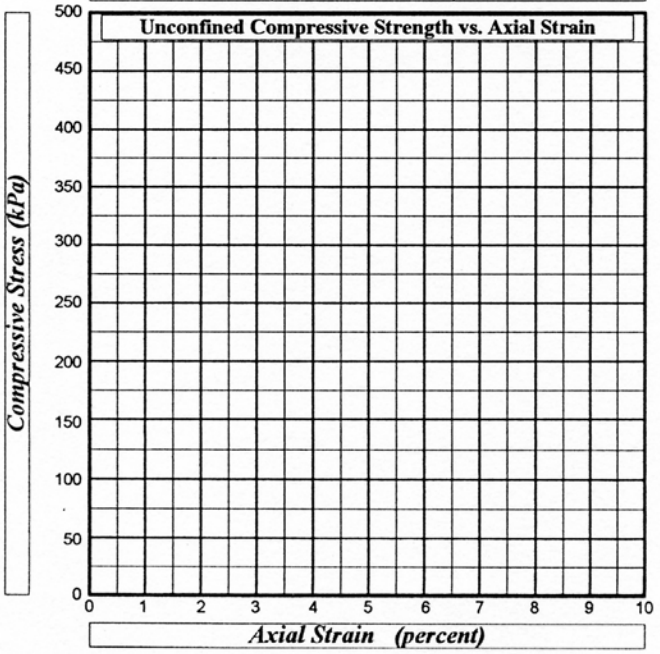
Compressive Strength: 113.9 kPa	Axial Strain: 7.2 %

Boring: B-5	Sample: 5-1	Depth: 0.8 m
Moisture: 24.2	Density: 1595 kg/m3	Length/Dia. 1.98



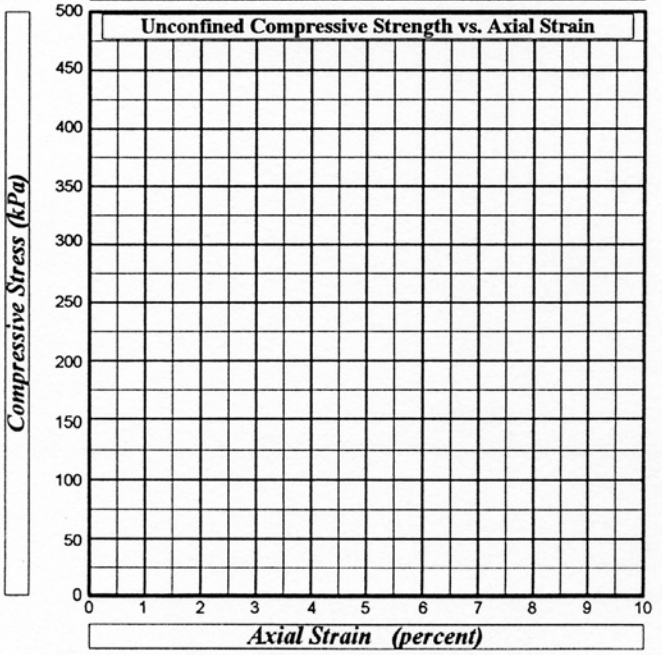
Compressive Strength: 159.9 kPa	Axial Strain: 9.7 %

Boring: B-5	Sample: 5-1	Depth: 0.8 m
Moisture: 14.9	Density: 1559 kg/m3	Length/Dia. 2.05



Compressive Strength:	Axial Strain:

Boring: B-7	Sample: 7-1	Depth: 0.8 m
Moisture: 26.0	Density: 1520 kg/m3	Length/Dia. 1.95



Compressive Strength:	Axial Strain:

Figure B-3

ALLIED LABORATORIES
350 South Washington
Wichita, KS 67202
(316) 262-6457

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

ASTM Designation: D 2487

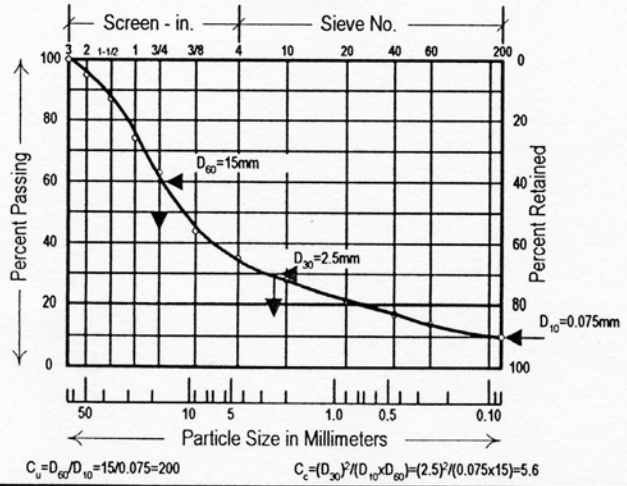
(Based on Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name[B]
Coarse-Grained Soils More than 50% retained on No. 200 sieve	**Gravels** More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]	GW	Well graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]	GP	Poorly graded gravel [F]
		Gravels with fines More than 12% fines[C]	Fines Classify as ML or MH	GM	Silty gravel [F,G,H]
			Fines Classify as CL or CH	GC	Clayey gravel [F,G,H]
	Sands 50% or more passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]	SW	Well graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]	SP	Poorly graded sand [I]
		Sands with Fines More than 12% fines[D]	Fines Classify as ML and MH	SM	Silty sand [G,H,I]
			Fines Classify as CL and CH	SC	Clayey sand [G,H,I]
Fine Gained Soils 50% or more passes the No. 200 Sieve	**Silts and Clays** Liquid limit less than 50.	Inorganic	PI>7 and plots on or above "A" line [J]	CL	Lean clay [K,L,M]
			PI<4 and plots on or below "A" line [J]	ML	Silt [K,L,M]
		Organic	Liquid limit - oven dried / Liquid limit - not dried ≤ 0.75	OL	Organic clay [K,L,M,N]
					Organic silt [K,L,M]
	Silts and Clays Liquid limit 50 or more	Inorganic	PI plots on or above "A" Line	CH	Fat clay [K,L,M]
			PI plots below "A" Line	MH	Elastic silt [K,L,M]
		Organic	Liquid limit - oven dried / Liquid limit - not dried ≤ 0.75	OH	Organic clay [K,L,M,P]
					Organic silt [K,L,M,Q]
Highly organic soils	Primarily organic matter, dark in color, and organic odor			Pt	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols:
GW-GM Well graded gravel with silt.
GW-GC Well graded gravel with clay.
GP-GM Poorly graded gravel with silt.
GP-GC Poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols:
SW-SM Well graded sand with silt.
SW-SC Well graded sand with clay.
SP-SM Poorly graded sand with silt.
SP-SC Poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$; $Cc = (D_{30})2 / (D_{10} \times D_{60})$.
[F] If soil contains $\geq$ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains $\geq$ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in hatched area, soil is a CL-ML silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel" to group name.
[L] If soil contains $\geq$ 30% plus No. 200, predominately sand, add "sandy" to group name.
[M] If soil contains $\geq$ 30% plus No. 4, predominately gravel, add "gravely" to group name.
[N] PI $\geq$ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.

SIEVE ANALYSIS



$C_u = D_{60}/D_{10} = 15/0.075 = 200$

$C_c = (D_{30})^2/(D_{10} \times D_{60}) = (2.5)^2/(0.075 \times 15) = 5.6$

PLASTICITY CHART

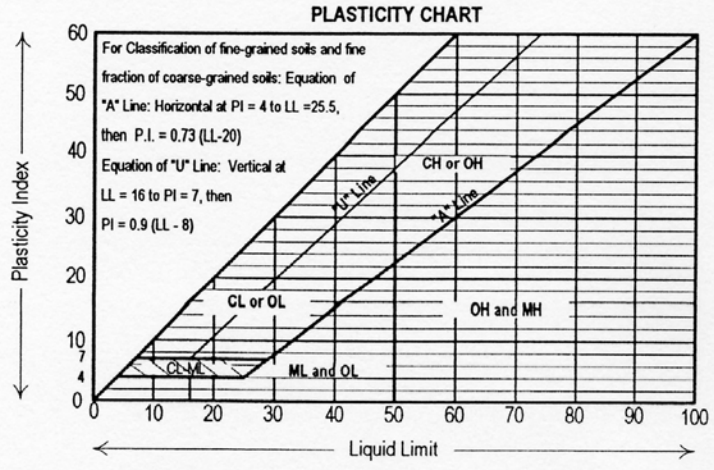


Figure B-4